

WHAT IS CLAIMED IS:

1. A method of preparing an asphalt recycled tire rubber emulsion which may be used as a crack-filler for asphalt and portland cement pavements, as a roof coating, slurry seal coating, or as a seal coat for asphalt pavements, the method comprising:

5 preparing a first mixture of a asphalt-recycled tire rubber base by mixing together a first weight percent AC-20 petroleum asphalt and a second weight percent of granulated recycled tire rubber by mixing the two components together at, and continuing to mix the two components at 400 degrees Fahrenheit for 90 minutes;

10 preparing a second mixture comprising a third weight percent water and a fourth weight percent clay, using warm water at 90 to 100 degrees Fahrenheit; and

adding the first mixture, at temperatures of 325 to 400 degrees to the clay in water solution to form an emulsion, slowly adding additional water as necessary to keep the temperature of the emulsion at between 160 and 210 degrees.

2. The method of claim 1 wherein, after all of the first mixture has been added to the second mixture, adding additional water to adjust the final viscosity to a range of 2500 to 20,000 centipoise.

3. The method of claim 1 wherein the first weight percent is 80.0% and the second weight percent is 20%.

4. The method of claim 1 wherein the third weight percent is 46.38% and the fourth weight percent is 53.62%.

5. The method of claim 1 wherein the clay comprises kaolinite.

6. The method of claim 1 wherein the clay comprises bentonite.

7. The method of claim 1 wherein the clay comprises magnesium silicate.

8. The method of claim 1 wherein the clay comprises a blend of kaolinite, bentonite and magnesium silicate..

9. The method of claim 1 wherein the first mixture further comprises a performance enhancing additive.

10. The method of claim 9 wherein the performance enhancing additive is selected from the group consisting of petroleum asphalt, petroleum base oils, reclaimed and recycled motor oils and fluxes, styrene butadiene - styrene coblock polymers, styrene isoprene - styrene coblock polymers, ethylene vinyl acetate polymers, polymer latex, manmade fiber and

natural fiber.

11. The method of claim 9 wherein the performance enhancing additive is selected from any one or more of the group comprising petroleum asphalt, petroleum base oils, reclaimed and recycled motor oils and fluxes, styrene butadiene - styrene coblock polymers, styrene isoprene - styrene coblock polymers, ethylene vinyl acetate polymers, polymer latex, manmade fiber, and natural fiber.
12. The method of claim 1 wherein the second mixture further comprises a pH adjusting substance.
13. The method of claim 12 wherein the pH adjusting substance is selected from the group consisting of hydrochloric acid, citric acid, acetic acid, chromic acid, sodium chromate, sodium dichromate, potassium dichromate, aluminum chloride, ferric chloride, sodium hydroxide, sodium metasilicate pentahydrate, and sodium metasilicate nanohydrate.
14. The method of claim 12 wherein the pH adjusting substance is selected from any one or more of the group comprising hydrochloric acid, citric acid, acetic acid, chromic acid, sodium chromate, sodium dichromate, potassium dichromate, aluminum chloride, ferric chloride, sodium hydroxide, sodium metasilicate pentahydrate, and sodium metasilicate nanohydrate.
15. The method of claim 1 wherein the second mixture comprises a co-emulsifier.
16. The method of claim 15 wherein the co-emulsifier comprises a nonylphenol surfactant.
17. The method of claim 15 wherein the co-emulsifier comprises quaternary ammonium chloride.
18. The method of claim 15 wherein the co-emulsifier comprises ferric chloride.
19. The method of claim 1 wherein the emulsion further comprises an end use modifying additive.
20. The method of claim 19 wherein the end use modifying additive is selected from the group consisting of crushed and sieve sized mineral aggregates, crushed and sieve sized recycled asphalt pavement, crushed and sieve sized portland cement concrete, and sand.
21. The method of claim 19 wherein the end use modifying additive is selected from any one or more of the group comprising crushed and sieve sized mineral aggregates, crushed and sieve sized recycled asphalt pavement, crushed and sieve sized portland cement concrete, and sand.

22. The method of claim 1 wherein the granulated recycled tire rubber is minus 16 mesh to minus 80 mesh.

23. An asphalt emulsion produced according to the method of claim 1.

24. A method of preparing an asphalt recycled tire rubber emulsion which may be used as a crack-filler for asphalt and portland cement pavements, as a roof coating, slurry seal coating, or as a seal coat for asphalt pavements, the method comprising:

preparing a first mixture of an asphalt-recycled tire rubber base by mixing together a first weight percent AC-20 petroleum asphalt and a second weight percent of granulated recycled tire rubber by mixing the two components together at, and continuing to mix the two components at 400 degrees Fahrenheit for 90 minutes;

preparing a second mixture comprising a third weight percent water, a fourth weight percent clay, and a fifth weight percent sodium metasilicate pentahydrate, using warm water at 90 to 100 degrees Fahrenheit; and

adding the first mixture, at temperatures of 325 to 400 degrees, to the clay in water solution to form an emulsion, slowly adding additional cold water as necessary to keep the temperature of the emulsion at between 160 and 210 degrees.

25. The method of claim 24 wherein, after all of the first mixture has been added to the second mixture, adding a third mixture comprising water, vinyl acrylic latex and fiberglass fibers.

26. The method of claim 24 wherein the first weight percent is 80.0% and the second weight percent is 20%.

27. The method of claim 24 wherein the third weight percent is 46.0%, the fourth weight percent is 53.7% and the fifth weight percent is 0.3%.

28. The method of claim 24 wherein the clay comprises kaolinite.

29. The method of claim 24 wherein the clay comprises bentonite.

30. The method of claim 24 wherein the clay comprises magnesium silicate.

31. The method of claim 24 wherein the clay comprises a blend of kaolinite, bentonite and magnesium silicate.

32. The method of claim 24 wherein the first mixture further comprises a performance enhancing additive.

33. The method of claim 32 wherein the performance enhancing additive is selected from the

group consisting of petroleum asphalt, petroleum base oils, reclaimed and recycled motor oils and fluxes, styrene butadiene - styrene coblock polymers, styrene isoprene - styrene coblock polymers, ethylene vinyl acetate polymers, polymer latex, manmade fiber and natural fiber.

- 5 34. The method of claim 32 wherein the performance enhancing additive is selected from any one or more of the group comprising petroleum asphalt, petroleum base oils, reclaimed and recycled motor oils and fluxes, styrene butadiene - styrene coblock polymers, styrene isoprene - styrene coblock polymers, ethylene vinyl acetate polymers, polymer latex, manmade fiber, and natural fiber.
- 10 35. The method of claim 24 wherein the second mixture further comprises a pH adjusting substance.
36. The method of claim 35 wherein the pH adjusting substance is selected from the group consisting of hydrochloric acid, citric acid, acetic acid, chromic acid, sodium chromate, sodium dichromate, potassium dichromate, aluminum chloride, ferric chloride, sodium hydroxide, sodium metasilicate pentahydrate, and sodium metasilicate nanohydrate.
- 15 37. The method of claim 35 wherein the pH adjusting substance is selected from any one or more of the group comprising hydrochloric acid, citric acid, acetic acid, chromic acid, sodium chromate, sodium dichromate, potassium dichromate, aluminum chloride, ferric chloride, sodium hydroxide, sodium metasilicate pentahydrate, and sodium metasilicate nanohydrate.
- 20 38. The method of claim 24 wherein the second mixture comprises a co-emulsifier.
39. The method of claim 38 wherein the co-emulsifier comprises a nonylphenol surfactant.
40. The method of claim 38 wherein the co-emulsifier comprises quaternary ammonium chloride.
- 25 41. The method of claim 38 wherein the co-emulsifier comprises ferric chloride.
42. The method of claim 24 wherein the emulsion further comprises an end use modifying additive.
43. The method of claim 42 wherein the end use modifying additive is selected from the group consisting of crushed and sieve sized mineral aggregates, crushed and sieve sized recycled asphalt pavement, crushed and sieve sized portland cement concrete, and sand.
- 30 44. The method of claim 42 wherein the end use modifying additive is selected from any one

or more of the group comprising crushed and sieve sized mineral aggregates, crushed and sieve sized recycled asphalt pavement, crushed and sieve sized portland cement concrete, and sand.

45. The method of claim 24 wherein the granulated recycled tire rubber is minus 16 mesh to minus 80 mesh.

46. An asphalt emulsion produced according to the method of claim 24.

47. A method of preparing an asphalt recycled tire rubber emulsion which may be used as a crack-filler for asphalt and portland cement pavements, as a roof coating, slurry seal coating, or as a seal coat for asphalt pavements, the method comprising:

preparing a first mixture of a asphalt-recycled tire rubber base by mixing together 79.70 weight percent AC-5 petroleum asphalt, 5.20 weight percent clear saturated petroleum oil, 0.60 by weight percent caustic soda, 2.60 by weight percent styrene butadiene copolymer, 6.20 by weight percent granulated recycled tire rubber, and 0.10 by weight percent sulfur by mixing the components together at 350 to 380 degrees

Fahrenheit;

maintaining the temperature of the first mixture at approximately 350 degrees Fahrenheit for a period of at least 8 hours;

preparing a second mixture at approximately 100 degrees Fahrenheit, the second mixture comprising 93.15 weight percent water, 6.05 weight percent clay, and 0.80 weight percent sodium dichromate; and

adding, slowly, the first mixture, at a temperature of approximately 350 degrees Fahrenheit, to the second mixture, and mixing the two mixtures together.

48. The method of claim 47 wherein the granulated recycled tire rubber comprises a range of minus 16 to minus 80 mesh.

49. The method of claim 47 wherein the clay comprises kaolinite.

50. The method of claim 47 wherein the clay comprises bentonite.

51. The method of claim 47 wherein the clay comprises magnesium silicate.

52. The method of claim 47 wherein the components of the first mixture are mixed together with a high shear mixer at 6000 rpm.

53. The method of claim 47 wherein the first mixture and second mixture are mixed together at 6000 to 8000 rpm.

54. The method of claim 47 wherein a third mixture comprising 1.0 weight percent nonylphenol surfactant and 40 moles ethylene oxide is added as the first mixture and second mixture are mixed together.

55. An asphalt emulsion produced according to the method of claim 47.

5 56. A method of preparing an asphalt recycled tire rubber emulsion which may be used as a crack-filler for asphalt and portland cement pavements, as a roof coating, slurry seal coating, or as a seal coat for asphalt pavements, the method comprising:

10 preparing a first mixture of a asphalt-recycled tire rubber base by mixing together 62.50 weight percent Performance Grade 64-22 petroleum asphalt and 10.00 weight percent granulated recycled tire rubber;

blending the first mixture at a temperature of 500 degrees Fahrenheit for 15 minutes;

15 adding to the first mixture, 11.50 weight percent tall oil pitch, 7.00 weight percent gilsonite, and 9.00 weight percent reclaimed and recycled motor oil flux to form a modified first mixture;

allowing the modified first mixture to cool to between 325 to 375 degrees Fahrenheit;

20 preparing a second mixture comprising 92.10 weight percent water, 0.47 weight percent sodium chromate, 3.48 weight percent nonylphenol surfactant, and 3.95 weight percent clay at a temperature of approximately 85 degrees Fahrenheit;

blending slowing the modified first mixture, at temperatures of 325 to 375 degrees Fahrenheit, to the second mixture to create an emulsion, mixing the emulsion for thirty minutes; and

25 adding a third mixture to the emulsion, the third mixture comprising an additional 2.25 by weight percent granulated recycled tire rubber and 2.05 by weight percent cationic styrene butadiene latex rubber, allowing the combination of the emulsion and the third mixture to cool to 75 degrees Fahrenheit.

57. The method of claim 56 wherein the granulated recycled tire rubber comprises a range of minus 16 to minus 80 mesh.

30 58. The method of claim 56 wherein the clay comprises kaolinite.

59. The method of claim 56 wherein the clay comprises bentonite.

60. The method of claim 56 wherein the clay comprises magnesium silicate.

61. The method of claim 56 wherein the modified first mixture and second mixture are mixed together at 6000 to 9000 rpm.

62. An asphalt emulsion produced according to the method of claim 56.

5 63. A method of preparing an asphalt recycled tire rubber emulsion which may be used as a crack-filler for asphalt and portland cement pavements, as a roof coating, slurry seal coating, or as a seal coat for asphalt pavements, the method comprising:

heating 62.50 weight percent Performance Grade 64-22 petroleum asphalt to 325 degrees Fahrenheit;

10 preparing a second mixture comprising 94.05 weight percent water, 0.45 weight percent chromic acid, and 5.50 weight percent clay at a temperature of approximately 90 degrees Fahrenheit;

blending the Performance Grade 64-22 petroleum asphalt, heated to 275 to 325 degrees Fahrenheit, to the second mixture to create an emulsion and mixing the emulsion for twenty minutes;

15 adding 10.00 by weight percent granulated recycled tire rubber to the emulsion; and

adding 4.0 by weight percent vinyl acrylic latex to the emulsion.

64. The method of claim 63 wherein the granulated recycled tire rubber comprises a range of minus 16 to minus 80 mesh.

65. The method of claim 63 wherein the clay comprises kaolinite.

66. The method of claim 63 wherein the clay comprises bentonite.

67. The method of claim 63 wherein the clay comprises magnesium silicate.

68. The method of claim 63 wherein the Performance Grade 64-22 petroleum asphalt and second mixture are mixed together at 6000 to 7500 rpm.

69. An asphalt emulsion produced according to the method of claim 63.

70. A composition of an asphalt-recycled tire rubber emulsion which may be used as a crack-filler for asphalt and portland cement pavements, as a roof coating, slurry seal coating, or as a seal coat for asphalt pavements, the composition comprising:

30 a first mixture of a petroleum asphalt-recycled tire rubber base comprising 80.0 percent by weight AC-20 petroleum asphalt and 20% by weight minus 20 mesh

granulated recycled tire rubber, the first mixture blended with a second mixture, the second mixture comprising 46.38 percent by weight water and 53.62 percent by weight clay, wherein the blended first mixture and second mixture results in an emulsion comprising 47.9 percent by weight water, 33.6 percent by weight asphalt-tire rubber and 18.5 percent by weight clay.

71. A composition of an asphalt-recycled tire rubber emulsion which may be used as a crack-filler for asphalt and portland cement pavements, as a roof coating, slurry seal coating, or as a seal coat for asphalt pavements, the composition comprising:

a first mixture of a petroleum asphalt-recycled tire rubber base comprising 80.0 percent by weight AC-20 petroleum asphalt and 20 percent by weight minus 20 mesh granulated recycled tire rubber, the first mixture blended with a second mixture, the second mixture comprising 46.0 percent by weight water, 53.7 percent by weight kaolinite clay, and 0.3 percent by weight sodium metasilicate pentahydrate, vinyl acrylic latex and fiberglass fibers, wherein the blended first mixture and second mixture results in an emulsion comprising 45.0 percent by weight water, 32 percent by weight asphalt-tire rubber, 17.5 percent by weight kaolinite clay, 0.1 percent by weight sodium metasilicate pentahydrate, 5.0 percent by weight vinyl acrylic latex and 0.4 % fiberglass fibers.

72. A composition of an asphalt-recycled tire rubber emulsion which may be used as a crack-filler for asphalt and portland cement pavements, as a roof coating, slurry seal coating, or as a seal coat for asphalt pavements, the composition comprising:

a first mixture of a petroleum asphalt-recycled tire rubber base comprising 79.70 percent by weight AC-5 petroleum asphalt, 5.20 percent by weight tall oil pitch, 0.60 percent by weight caustic soda, 2.60 percent by weight styrene butadiene copolymer, 6.20 percent by weight 80 mesh granulated recycled tire rubber, and 0.10 percent by weight sulfur, the first mixture blended with a second mixture and a third mixture, the second mixture comprising 93.15 percent by weight water, 6.05 percent by weight bentonite clay, and 0.80 percent by weight sodium dichromate, and the third mixture comprising 1.0 percent by weight nonylphenol surfactant with 40 moles of ethylene oxide wherein the blended first mixture, second mixture and third mixture results in an emulsion comprising 46.20 percent by weight water, 49.4 percent by weight asphalt-tire rubber, 3.0 percent by



weight bentonite clay, 0.4 percent by weight sodium dichromate, and 1.0 percent by weight nonylphenol surfactant.

73. A composition of an asphalt-recycled tire rubber emulsion which may be used as a crack-filler for asphalt and portland cement pavements, as a roof coating, slurry seal coating, or as a seal coat for asphalt pavements, the composition comprising:

a first mixture of a petroleum asphalt-recycled tire rubber base comprising 62.50 percent by weight Performance Grade 64-22 petroleum asphalt, 10.00 percent by weight minus 30 mesh granulated recycled tire rubber, 11.50 percent by weight tall oil pitch, 7.00 percent by weight gilsonite, and 9.00 percent by weight reclaimed and recycled motor oil flux, the first mixture blended with a second mixture and a third mixture, the second mixture comprising 92.10 percent by weight water, 0.47 percent by weight sodium chromate, 3.48 percent by weight nonylphenol surfactant, and 3.95 percent by weight bentonite clay, and the third mixture comprising 2.25 percent by weight minus 30 mesh granulated recycled tire rubber and 2.05 percent by weight cationic styrene butadiene latex rubber, wherein the blended first mixture, second mixture and third mixture results in an emulsion comprising 49.0 percent by weight water, 42.50 percent by weight asphalt-tire rubber, 2.10 percent by weight bentonite, 2.25 percent by weight additional minus 30 mesh granulated recycled tire rubber, 0.25 percent by weight sodium dichromate, 1.85 percent by weight nonylphenol surfactant, and 2.05 percent by weight cationic rubber latex.

74. A composition of an asphalt-recycled tire rubber emulsion which may be used as a crack-filler for asphalt and portland cement pavements, as a roof coating, slurry seal coating, or as a seal coat for asphalt pavements, the composition comprising:

petroleum asphalt meeting the specifications for Performance Grade 64-22 petroleum asphalt, the petroleum asphalt blended with a second mixture and a third mixture, the second mixture comprising 94.05 percent by weight water, 0.45 percent by weight chromic acid, and 5.5 percent by weight bentonite clay, and the third mixture comprising 10.0 percent by weight minus 30 mesh granulated recycled tire rubber, and 4.0 percent by weight vinyl acrylic latex, wherein the blended petroleum asphalt, second mixture and third mixture results in an emulsion.